INSTRUCTION MANUAL

Telonic

INDUSTRIES, INC

TELONIC INSTRUMENTS AND ACCESSORIES

Products manufactured by TELONIC INDUSTRIES, INC. are guaranteed against defective materials and workmanship for a period of one year (vacuum tubes and semiconductors excepted) from date of purchase. This warranty does not apply to instruments that have been altered, improperly handled or damaged in any way beyond our control.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time, and to furnish merchandise in accordance with current specifications, without incurring any liability to modify equipment previously sold.

RETURNING EQUIPMENT TO FACTORY

Factory service is available for repair and readjustment of this instrument. However, a description of the trouble should be forwarded FIRST, whereupon instructions for correcting the trouble OR authorization for returning the equipment will be given. This applies to all units, whether under warranty or not.

L-1

L-1

SERIAL NO. A7226

PLUG IN OSCILLATOR

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SECTION I

SPECIFICATIONS

MODELS L-1 AND L-1M

INTRODUCTION

This unit is a plug-in sweep oscillator unit for use with designated Telonic control chassis. All the features of the control chassis are utilized with this unit, including the sweep ratio and sweep rate functions.

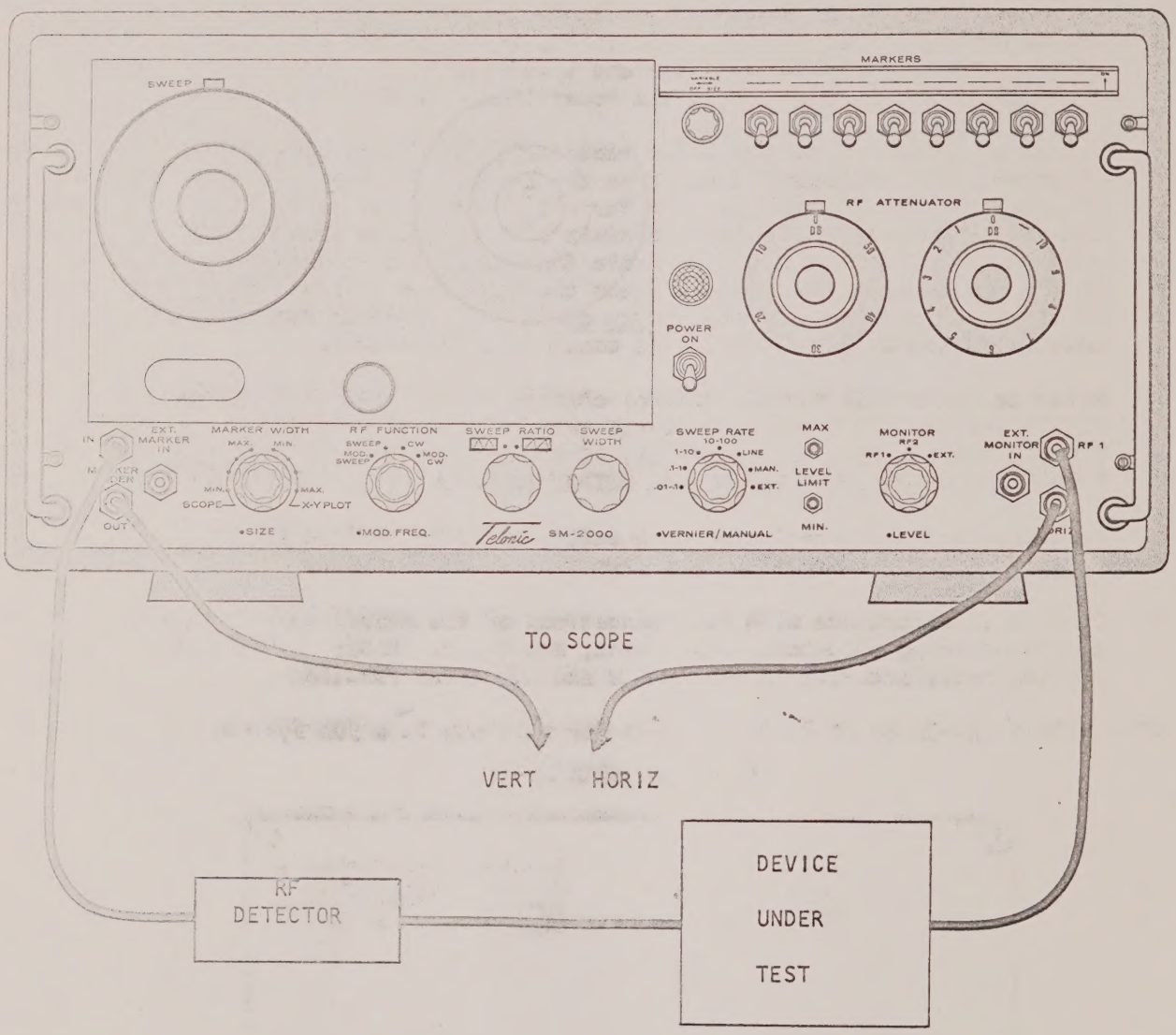
The L-1M contains a variable marker covering the swept frequency range. This difference is clearly indicated throughout this manual.

SPECIFICATIONS

*CW AND SWEEP CENTER FREQUENCY RANGE	200-1000 Kc
*SWEPT FREQUENCY RANGE	150-1250 Kc
SWEEP WIDTH	0.05 - 50%
OUTPUT VOLTAGE	1v rms into 50Ω
FLATNESS	±0.25 db overall
LINEARITY	Better than 1.2:1
VERNIER LEVEL CONTROL RANGE	0-6 db
VARIABLE MARKER	
Frequency	125-1600 Kc
Accuracy	±0.25%

* With 50Ω termination

TYPICAL SET UP



The front panel contains two controls (only one if variable marker is not installed).

SWEEP — The Sweep Dial, which sets the center frequency of the sweep oscillator by means of a variable capacitor.

MARKER — The Marker Dial, calibrated in 3 ranges to cover the full swept range of the sweep oscillator.

1. Make sure the control chassis power is OFF before inserting the plug-in oscillator into the control chassis. If the power is ON, transient voltages may damage diodes in the units. Insert plug-in oscillator and secure it in the chassis by tightening the fastening rod with the knob in the lower center of the front panel.

2. Make connections to the scope (or counter), the device under test, and RF Detector as shown. All connectors located on the sweep generator are BNC type and it is recommended that RG cable be used for all connections. This insures good ground connection between the devices, minimizes hum, leakage from unit and pick up of spurious external signals. The cable that is used to connect the RF OUTPUT to the device under test should match the impedance of the sweep generator (50Ω). If the input impedance of the device under test is other than 50Ω, a matching network should be used to insure a constant input signal.

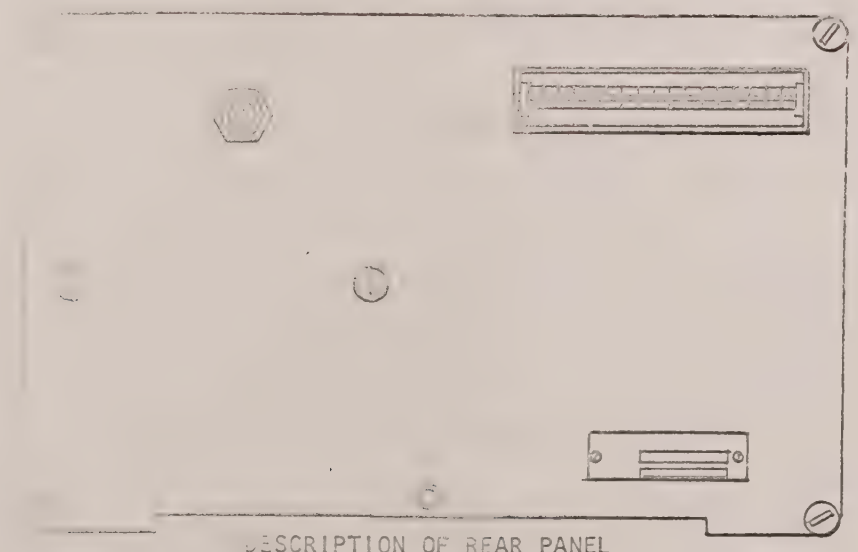
3. Refer to the manual for the control chassis for additional instructions. NOTE: DUE TO THE FACT THAT A MONITOR BUILT INTO THE L-1 IS USED INSTEAD OF THE ONE ON THE CONTROL CHASSIS, THE SETUP MUST BE OPERATED WITH THE MONITOR SELECTOR SWITCH IN THE RF 2 POSITION, EVEN THOUGH THE OUTPUT IS TAKEN AT THE RF 1 CONNECTOR.

4. To insure proper operation of both units, refer to Section IV (CALIBRATION OF L-1 AND CONTROL CHASSIS). See also OFF RESONANCE under GENERAL DESCRIPTION.

5. Proceed in accordance with recommendations of the manufacturer of the device under test concerning alignment, adjustment and tests. NOTE: The L-1 does not operate satisfactorily in the MOD CW and MOD SWEEP functions.

*The Teionic XD-3A or XD-8A is suitable for this use in a 50Ω system.

DRAWING OF REAR PANEL



DESCRIPTION OF REAR PANEL

The two electrical connectors on the rear panel are:

A BNC plug, which mates with a BNC jack on the control chassis. This is the RF output connector.

A contact plug which makes the other electrical contacts necessary with a mating jack on the control chassis.

SECTION III
OPERATING DESCRIPTION

Sweep Oscillator

The sweep oscillator is a modified Butler circuit with inductive coupling to the output.

The frequency is swept by a triangular or sawtooth drive (from the control chassis) applied to the reactor which varies the inductance in the oscillator tank circuit. The oscillator tank capacitance is controlled by the front panel [illegible] control.

The sweep is controlled by the control chassis as explained in the manual for that unit. Various level control signals are developed in the L-1 and coupled to the [illegible] reactor amplifier.

Variable Marker Oscillator

The variable marker oscillator also is a modified Butler circuit. The oscillator sweeps the 250-800Kc range. The signal from the marker oscillator is mixed with a sample of the sweep oscillator in a two-diode mixer circuit, producing [illegible] frequencies which are shaped and amplified in the control chassis [illegible] marker system and applied to the demodulated output of the device [illegible].

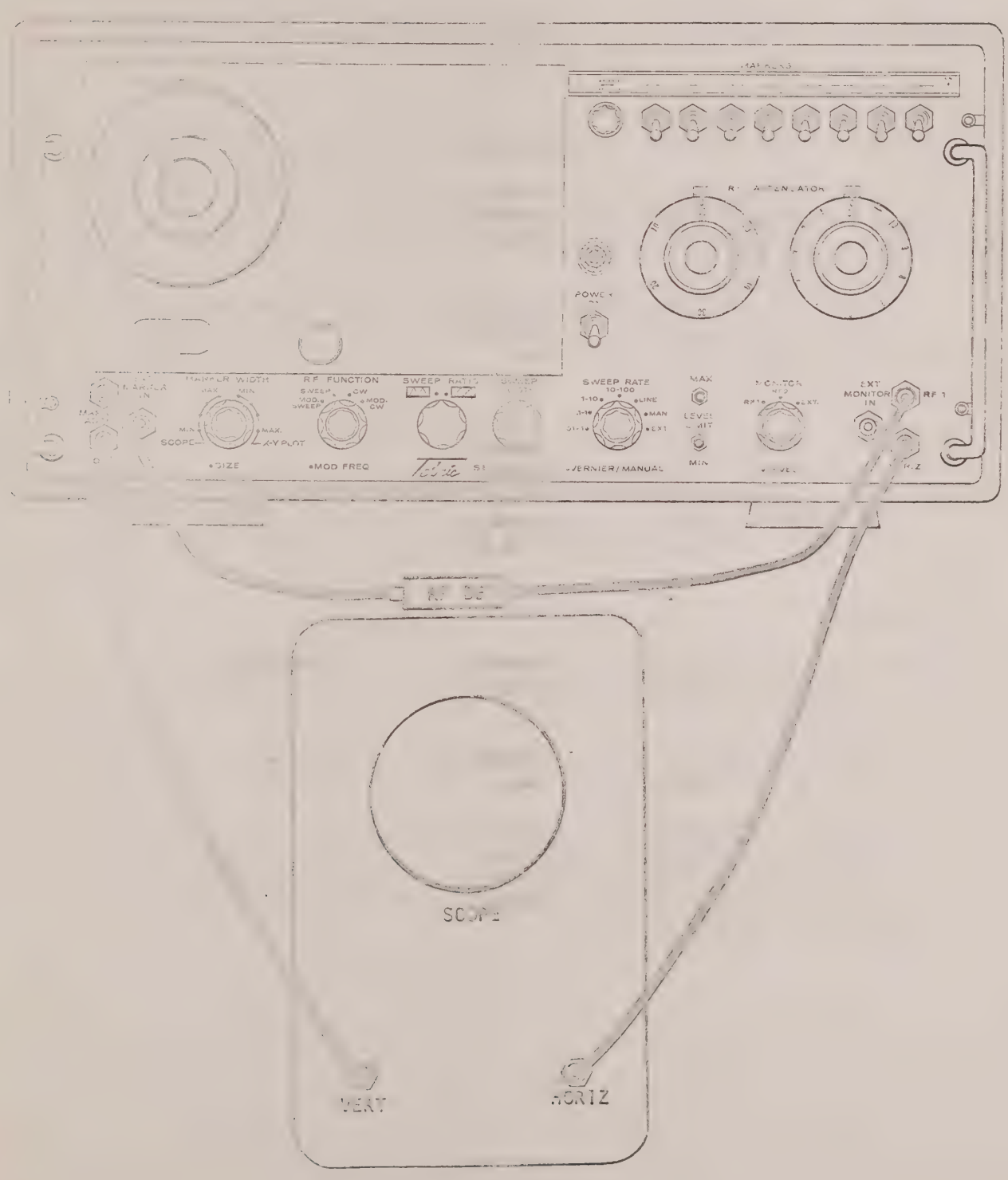
Saturable Reactor

[illegible] resistance, the mechanical vibration of the saturable [illegible] causes instantaneous sweep oscillator frequency. This phenomenon exhibits [illegible].

[illegible] low amplitude variation from a level output [illegible] demodulated output.

[illegible] locks in or remains at a constant frequency for [illegible] time. Points where this is occurring can be located by tuning [illegible] marker (L-1M only) across the swept range. A lock-in is [illegible] by an abrupt change in variable marker amplitude occurs [illegible] tuning the counter.

SECTION IV .. CALIBRATION PROCEDURE



TYPICAL SET UP

...rocedure should be applied after changing any component in the ..., or at any time the calibration is noted to be incorrect.

...alibration involves adjustment of three different classes of controls.

...located in the plug-in which affect the operation of the control chassis.

...located in the plug-in and affecting plug-in functions only.

...located in the control chassis which affect the operation of the plug-in.

... controls is discussed in the manual for the control chassis. ...ted here.

...

...-controlled harmonic marker (such as the Telonic CDH-1.0)
...-controlled harmonic marker (such as the Telonic CDH-0.1)
... RF Detector (such as the Telonic XD-3A)
... oscilloscope

... accuracy in certain adjustments, a counter may be used, provided ... maintained.

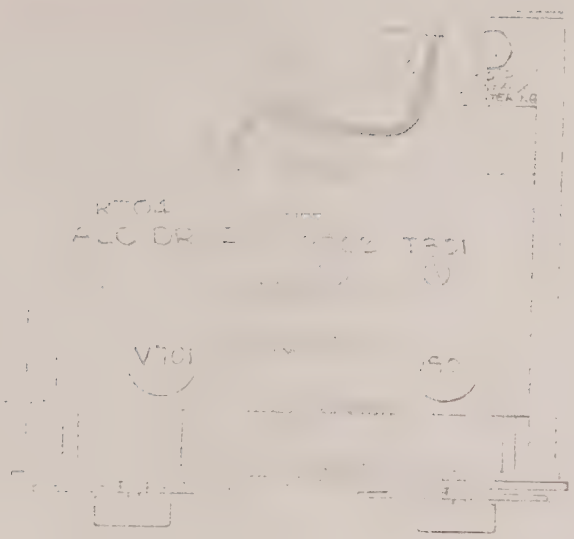
...

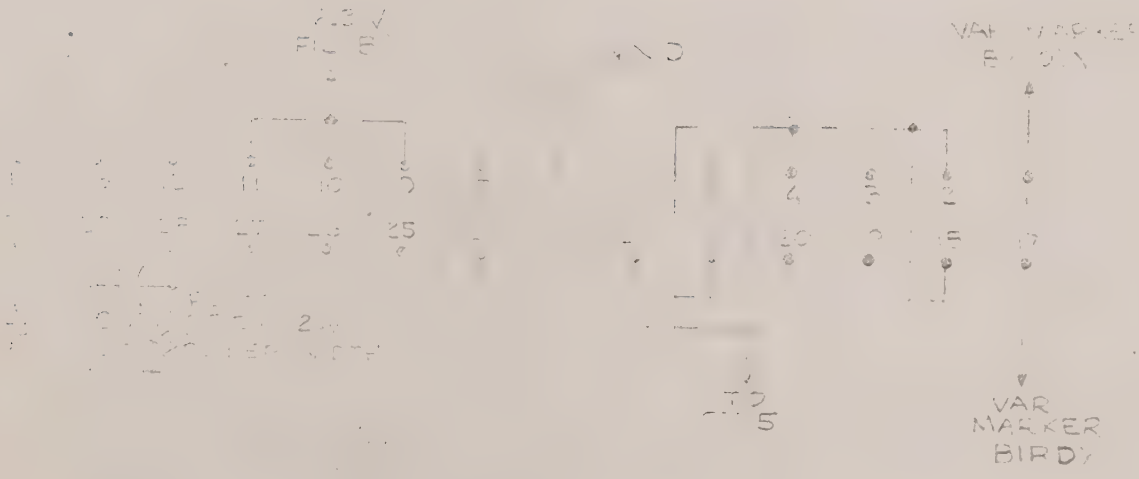
...

... (RG) 50Ω cable for all RF connections to insure good ... minimum radiation, and to avoid pickup of spurious signals. ... must match the 50Ω cable, or a matching network must be used.

... OFF, plug in the L-1 and secure in place.

... ..., allow a 15 minute warmup period, and make adjustments as ...


V701


VAR
MARKER
BIRDY

...G (Adjustment)

...TERING Control is set for optimum dial accuracy.

...the following controls:

...Chassis

SWEEP WIDTH - near minimum
1 Mc marker ON
Variable and other fixed markers OFF

SWEEP Dial to 1 Mc

...the 1 Mc marker on the display.

... CENTERING Control to center the 1 Mc marker on the scope trace.

...se sweep width, using the MIN CENTERING Control to maintain the marker ...center of the trace, until sweep width is near minimum.

...ly check the dial accuracy at any other desired frequencies, adjusting ... CENTERING Control to divide errors, if any, as nearly equally as ... over the range. If desired, this control may be set instead to pro... dial accuracy at a preferred frequency setting.

...NG (Adjustment)

...ront panel SWEEP WIDTH Control fully clockwise and adjust MAX CENTERING ...obtainable linearity.

...Adjustment)

...tment is set to provide 50% sweep width. The percent of sweep width ...ately constant over the range, thus will be 50% at any other center ...

...following controls:

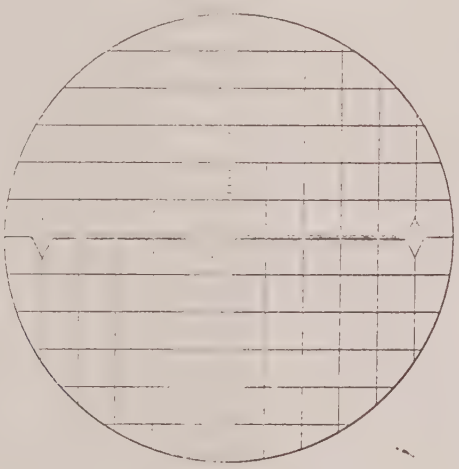
...Chassis
0 Mc and 0.1 Mc harmonic markers ON
Variable and other fixed markers OFF
SWEEP WIDTH fully clockwise

SWEEP Dial to 500 Kc

After identifying the 0.1Mc harmonics, turn OFF the 1.0MC marker. Adjust SWEEP [illegible] on the L-1 until 3 markers (400-600Kc) appear on the display. Alternately adjust the SWEEP Dial and SWEEP WIDTH Controls on the L-1 until the 400KC marker is at the left end of the trace and the 600Kc marker is at the right end. See Figure below.

NOTE: The SWEEP Dial is calibrated at minimum sweep width and, due to some non-linearity in the sweep, will not read exactly 500Kc at the conclusion of this adjustment.

Now readjust MIN CENTERING and MAX CENTERING as above, if necessary.

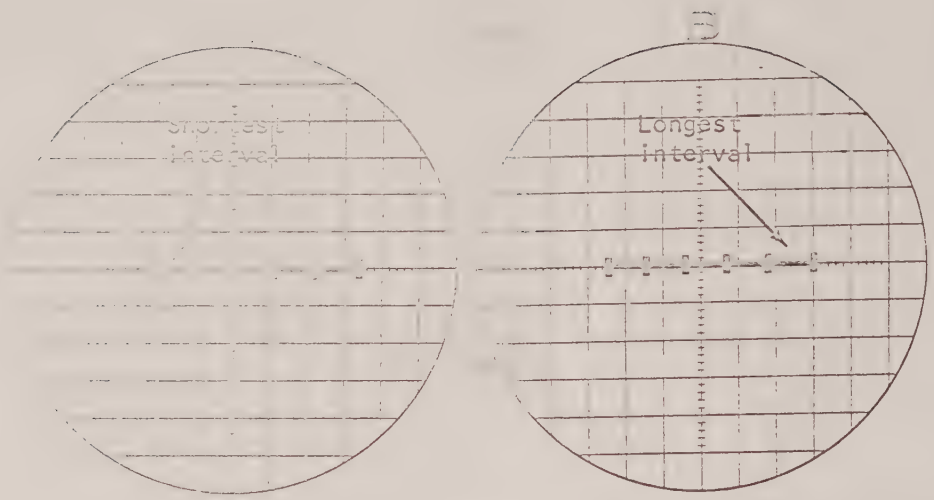


LINEARITY CHECK

Linearity measurements are made at full sweep width with the oscilloscope in the DC mode and the Control Chassis SWEEP RATE Control in the 1-10 position.

[illegible] controls set as at the conclusion of the SWEEP WIDTH adjustment set the SWEEP Dial to the point at which 5 marker intervals occupy the full trace.

Locate the shortest marker interval. Adjust the horizontal gain control on the scope so that this interval occupies exactly one scope division. See Figure A on the next page. Locate the longest marker interval. Adjust the horizontal position on the scope so that the interval begins on a graticule line. Measure the marker interval. Its length (in scope divisions) indicates the linearity ratio: A length of 1.15 scope divisions for the longest marker interval represents a linearity of 1.15 to 1. See Figure B on the next page.



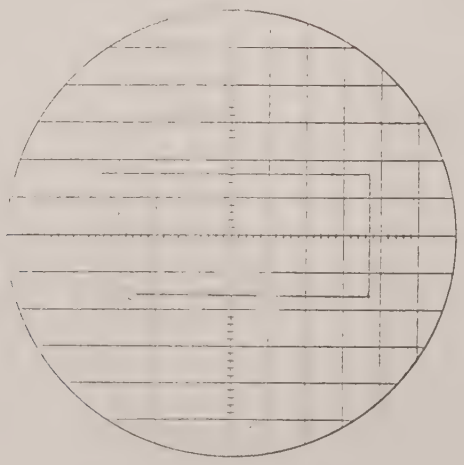
... (MAX. and MIN.) (Control Chassis)

... LIMIT Control has been set, reduce the output level to exactly 1v rms ... LEVEL LIMIT.

... attenuation, not to exceed 6 db, in an amount equal to the desired ... the LEVEL Control and note the output level.

... 0 db, and rotate the LEVEL Control fully counter-clock- ... LEVEL LIMIT for the same output noted with 6 db fixed attenuation.

... determines the gain of the servo loop including the sweep oscillator, ... detector and filter, and the leveler amplifier. If this gain is too ... frequency oscillations will occur in the loop, resulting in amplitude ... on the RF output at the frequency of oscillation. This will be sensed ... detector and appear on the scope trace as a waveform, frequently damped. ... ing through the control chassis marker circuitry, this oscillation also ... can be noted even though there is no connection to the RF output. A ... mentation of the detected output with loop oscillation is seen below.



...LC DRIVE is set at the factory for ...ter gain and ordinarily requires no ...adjustment, even after component change...

...e loop oscillates, the ALC DRIVE should be readjusted to correct the trouble. ...readjusting the control, follow the steps outlined below.

Preset the following controls:

Control Chassis

...ONITOR Selector to RF 2
SWEEP RATE to about 1 cps
RF FUNCTION to SWEEP
Fixed markers OFF
...to Maximum
SWEEP RATIO to ...
...KER SIZE and VAR/EXT 1/3 clockwise
...F LEVEL fully clockwise

...-1

SWEEP to 200 Kc

Temporarily disconnect the load from the RF output.

These are the conditions under which loop oscillation is most likely to occur; however, should the oscillation cease, vary the RF LEVEL and SWEEP Dial until it ...

... shown on the first page of this section, adjust the ALC DRIVE ... oscillation just ceases. If the output is then unleveled (evidenced by ... in the trace), adjust the MAX LEVEL LIMIT to restore leveling action. ... these two adjustments until a leveled output without loop oscillation is ...

NOTE: Do not set the ALC DRIVE beyond the point necessary to prevent loop oscillation. Doing so can decrease the loop gain to the point where AM and FM "hum" modulation of the output is a problem.

Next, reconnect the load and reset MAX and MIN LEVEL LIMIT as prescribed above.

FLATNESS CHECK

Flatness is measured over the entire swept range of the L-1; in this range, the minimum output must be not more than 0.5 db lower than the maximum output at any frequency setting.

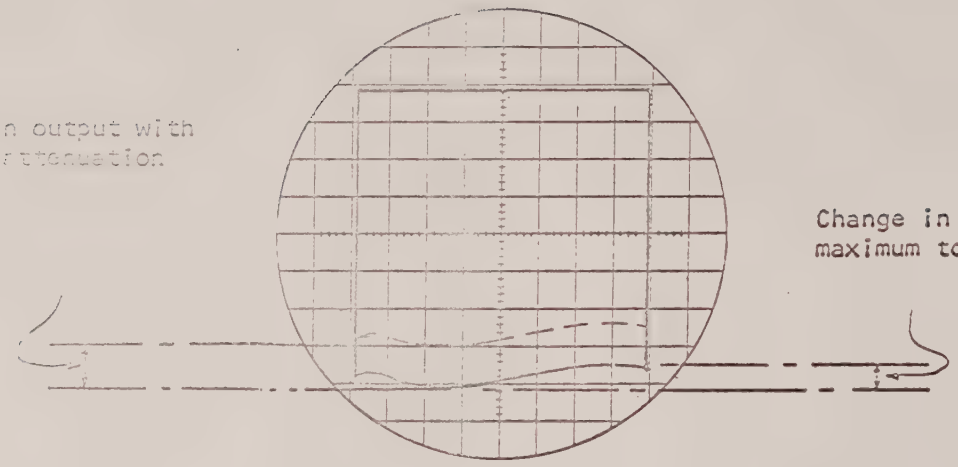
...eset the following controls:

SWEEP WIDTH fully clockwise
...F LEVEL fully clockwise
... markers OFF
...ONITOR SELECTOR to RF 1

...OTE: Be sure the LEVEL MAX and MIN Controls are adjusted as prescribed in the manual for the control chassis.

...ate the SWEEP Dial through its calibrated range, noting the maximum and minimum outputs.

...are the difference between these outputs with the reduction in output resulting ...om the insertion of 1 db attenuation. The difference between the maximum and ... must be no greater than half the change caused by the 1 db attenuation.



Refer to chassis layout for location of C802 and T801.

the following controls:

fully clockwise
to maximum
0.1 Mc mark

Dial to 800 Kc
Dial to 1600 Kc

to superimpose the variable marker over the fixed marker at 800 Kc.

L-M controls as follows:

Dial to 500 Kc
Dial to 125 Kc

to superimpose the variable marker over the fixed marker at 500 Kc.

the above procedures until the markers are superimposed at each end of the frequency range each time the dials are set as prescribed.

SECTION V MAINTENANCE

TROUBLESHOOTING

Since the oscillator module is a plug-in unit, many of the possible malfunctions of the oscillator are the result of part failure in the control chassis. The connections at P601 of the plug-in and at J601 of the control chassis afford a convenient means of tracing the source of troubles to the oscillator or control chassis.

In troubleshooting troubles which have been traced to the oscillator, application of the usual methods of electronic maintenance, including a visual check for damage, broken wires, glowing anodes, shorted tuning capacitors, and charred resistors, should be made. All connectors, particularly P601 and J601, should be checked for cleanliness.

EXTENSION CABLE

For convenience in making work requiring access to parts located on the under side of the chassis, or in other areas not easily reached, an extension cable may be obtained from Telonic Industries, Inc. This cable, having the 32-contact plug on one end and the 32-contact jack on the other, allows the plug-in oscillator to be removed from the control chassis and operated on the bench.

ACCESS TO RF COMPARTMENT

There are four unlacquered screws on the cover to the RF compartment. Only these need to be removed in taking off the cover.

The lacquered screws hold the shield in place and have nothing to do with covering the cover.

The following chart will be of service in deciding whether a trouble lies in the oscillator or control chassis. It is assumed that the

	CHECK (on P601)
[illegible] of RF output or [illegible] leveled output	DC voltage at Pin 32 with RF LEVEL fully clockwise.
[illegible] sweep [illegible]	1. Voltage waveform, Pin 14 to ground.
	2. Next - resistance between Pins 14 and 15, 28 and 29, 30 and 4 with plug-in removed.
[illegible] variable marker	1. For birdy at Pin 17
	2. DC voltage at Pin 1

[illegible] shows that the trouble probably is in the control chassis, refer [illegible] the maintenance section of the manual for that unit.

[illegible] appears to be in the plug-in, the following chart may be of [illegible] in localizing the failure:

	CHECK
[illegible] output or [illegible] leveled output	V701 and associated circuitry. Continuity from Pin 31 of P601 to Pin 1, 6, or 7 of V701.
[illegible] sweep [illegible]	Check R602, R603, and R605, and L701A.
Variable marker	Check V801 and associated circuitry, including sweep sample line. Change diodes in mixer circuit and check other mixer components.
[illegible] marker	Diodes in mixer circuit. V801 and associated circuitry. Sweep sample line. If markers on one range are considerably more prominent than those on another, substitute diodes to optimize all.
[illegible] [illegible]	Check both mixer diodes and change if necessary. Be sure diodes are inserted with correct polarity.

...required have been applied and that the jumpers on P601 are intact. Where "inconclusive" is shown, the next step should be followed.

IF RESULT IS	TROUBLE PROBABLY IN	
	OSCILLATOR	CONTROL CHASSIS
High 100-175v	X	
Low or zero 0-100v		X
Sawtooth or triangular waveform	X	
0V or DC voltage	Inconclusive. See Check #2.	
Open or any check	X	
Continuity		X
Birdy present		X
No birdy	Inconclusive. See Check #2.	
30v	X	
0V or no voltage		X

SCHEMATIC PART DESIGNATION

C	Capacitor
CR	Crystal Rectifier, Germanium Diode
J	Jack
L	Inductor
P	Plug
R	Resistor, Fixed or Variable
V	Tube

SCHEMATIC VALUE ABBREVIATION

Ω	ohms
K	1,000 ohms
M	1,000,000 ohms (megohms)
µf	Microfarad
pf	Picofarad
µh	Microhenry
mh	Millihenry

OTHER ABBREVIATIONS

F.P.	Front Panel
R.P.	Rear Panel
T.P.	Test Point

RESISTORS - All resistors are 1/2 watt, ±10%, and are shown in ohms, unless otherwise specified.

CAPACITORS - All capacitors are shown in picofarads (pf) unless otherwise specified.

COILS - All inductors are shown in microhenries (µh) unless otherwise specified.

CIRCUIT REFERENCE SYMBOL - LOCATION INFORMATION

601-699	Interconnecting elements	701-799	Sweep Oscillator
		801-899	Variable Marker

* Indicates value of component adjusted at factory, and may deviate from value

PARTS LIST FOR L-1

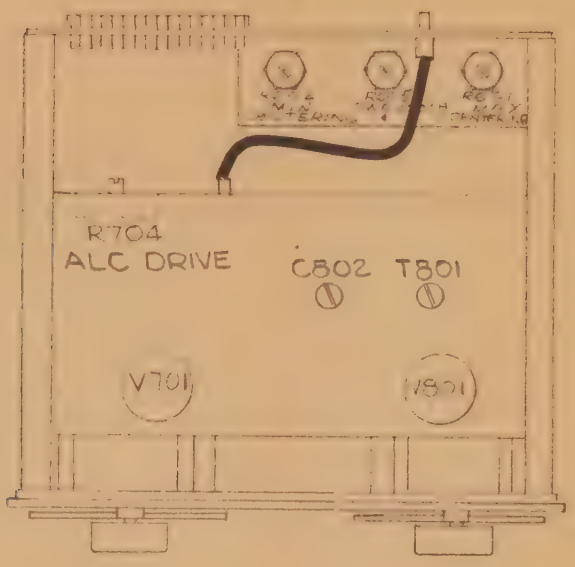
	DESCRIPTION	TELONIC PART NO.
	CFM, 2200pf, ±10%, 500 VDCW (SC)	C-24
	CVA, dual, 500 pf per section	C-421
	CFC, 350 pf, ±10%, 1000 VDCW	C-17
C703	Not assigned	
	SC	
C705	CFCF, 1000 pf, +100%-0%, 500 VDCW	C-110
C71	CFCF, 470 pf, ±20%, 500 VDCW	C-111
CR70	DS, 1N34A	D-2
	RJ, 2545-1	J-10
	PC, UG-88B/U	J-32
		J-27
	Recator, saturable	09142
	.F, 1mh	L-116
	.F, 10mh	L-110
	.F, 6.8 µh, ±10%	L-106
	Same as L703	
	IF, 500 µh, ±10%	L-109
	Same as L703	
L711	IF (SC)	L-208
L712 L7	F 2.2 µh	L-101
	RVC, 50KΩ, ±10%, 2W	R-751
	VC, 250Ω, ±10%, 2w	R-771
	SC	
	RFC, 12KΩ, ±10%, 1/2 W	R-119
	RVC, 250 KΩ, ±10%, 1/2 W	R-752
	RFC, 68 KΩ, ±10%, 1/2 W	R-51
	RFC, 2.7 KΩ, ±10%, 1/2 W (SC)	R-114
	RFC, 47Ω, ±10%, 1/2 W (SC)	R-55
	RFC, 100Ω, ±10%, 1/2 W	R-15
	RFC, 39 KΩ, ±10%, 1/2 W	R-26
	RFC, 2.7 KΩ, ±10%, 1/2 W (SC)	R-114
	RVC, 1KΩ, ±30%, 0.3 W	R-710
	RFC, 1KΩ, ±10%, 1/2 W (SC)	R-18
	RFC, 5.6 KΩ, ±10%, 1/2 W	R-22
	RFC, 1.8 KΩ, ±10%, 1/2 W	R-19
V701	TE, 12BH7A	VT-14
	Socket, tube, 9-pin	S-31
	Clip, diode	S-9

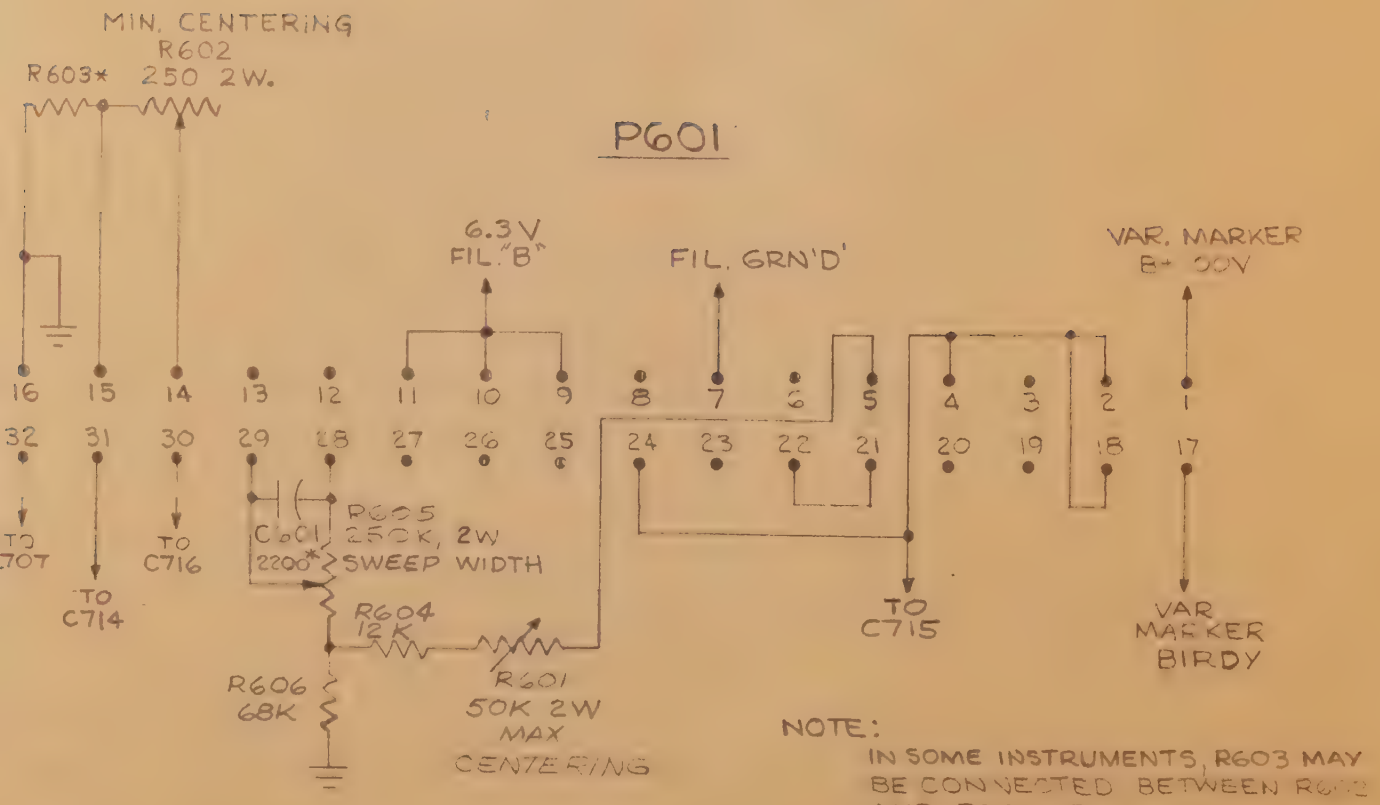
VARIABLE MARKER (-1M ONLY)

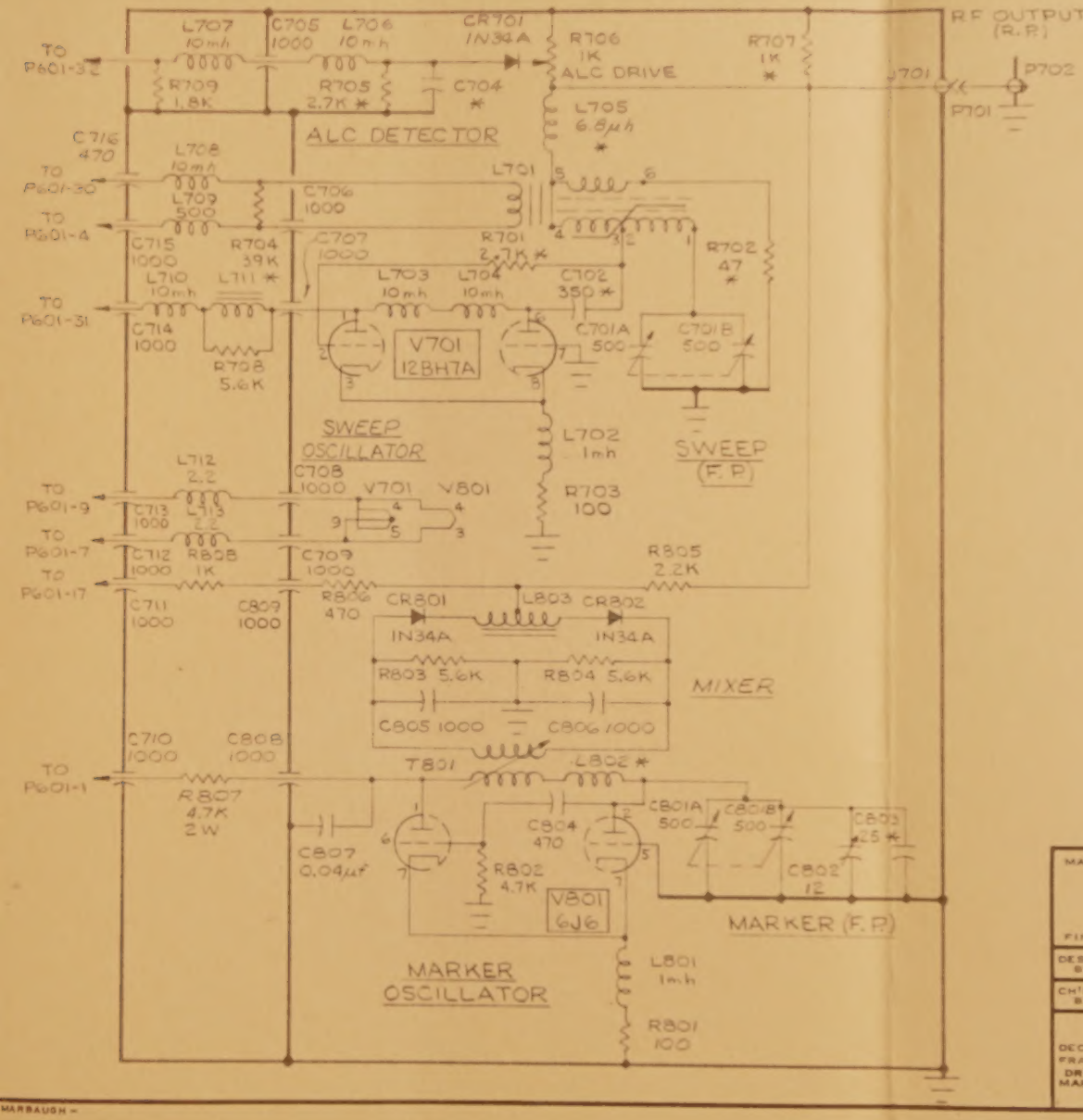
		TELONIC PART NO.
	CVA, dual, 500 pf per section	C-421
	CVC, 2-12 pf	C-432
	CFC, 25 pf, ±10%, 500 VDCW	C-9
	CFC, 470 pf, GMV, 1000 VDCW	C-18
	CFC, 1000 pf, GMV, 1000 VDCW	C-19
	CFC, 0.04 µf, +80-20%, 500 VDCW	C-53
	CFCF, 1000 pf, +100-0%, 500 VDCW	C-110
	[illegible]	L-116
	[illegible]	L-117
	[illegible]	09140
	[illegible], 100 Ω, ±10%, 1/2 W	R-15
	[illegible], 4.7 KΩ, ±10%	R-21
	[illegible], 5.6 KΩ, ±10%, 1/2 W	R-22
	[illegible], 2.2 KΩ, ±10%, 1/2 W	R-19
	[illegible], 470 Ω, ±10%, 1/2 W	R-42
	[illegible], 4.7KΩ, ±10%, 2 W	R-306
	[illegible], 1 KΩ, ±10%, 1/2 W	R-18
	Transformer, R.F.	09141
	[illegible], 6U8	VT-7
	[illegible]t, tube, 7-pin	S-32
	[illegible] diode (2 required)	S-9

ABBREVIATION CODE

C	Capacitor, fixed, ceramic
CF	Capacitor, fixed, ceramic feed-thru
CM	Capacitor, fixed, mica
CV	Capacitor, variable, air
CVC	Capacitor, variable, ceramic
D	Diode, semiconductor
L	Inductor, fixed
J	Jack, cable
P	Plug, cable
RFC	Resistor, fixed, composition
RC	Receptacle, jack
RVC	Resistor, variable, composition
SC	Subject to change
VT	Tube, electron


R704
ALC DRIVE
C802
T801
V701
V801


MIN. CENTERING
R602
R603* 250 2W.
P601
6.3V
FIL. "B"
FIL. GRN'D'
VAR. MARKER
B+ 100V
16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17
TO C707
TO C714
TO C716
C601 2200*
R605 250K, 2W SWEEP WIDTH
R604 12K
R606 68K
R601 50K 2W MAX CENTERING
TO C715
VAR MARKER BIRDY
NOTE:
IN SOME INSTRUMENTS, R603 MAY BE CONNECTED BETWEEN R602 AND P601-15



MAT'L.

FINISH

DESIGN BY	DATE	DRAWN BY	DATE
CH'K'D. BY		PROD. APP'D.	

TOLERANCES
UNLESS SPECIFIED WITH LIMITS
DECIMAL DIMENSIONS MAY VARY ± .005–.005
FRACTIONAL DIMENSIONS MAY VARY ± 1/64–1/64
DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURER'S TOLERANCES ARE NOT INCLUDED.
DO NOT SCALE THIS DRAWING

NO.	REVISIONS	DATE

Telonic INDUSTRIES, INC.
60 N. FIRST AVE. BEECH GROVE, INDIANA

SCALE | PART NO.

L-1M SCHEMATIC
SM2000

SHEET 2 OF 2 | SB003-0126

MARBAUGH

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6/63

INDUSTRIES INC.

BEECH GROVE, INDIANA

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